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07/11/2011 04:47 AM

To: Michael Eller, Alysa Suero, Charles Kanetsky, William Arguto
cc
bcc
Subject: Fw: Scranton Times-Tribune (7-10) Stray gas plagues NEPA Marcellus wells

FYI.--Vicky

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Date: 07/10/2011 03:03 PM
Subject: Fw: Scranton Times-Tribune (7-10) Stray gas plagues NEPA Marcellus wells

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Sent: 07/10/2011 10:16 AM EDT

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Subject: Scranton Times-Tribune (7-10) Stray gas plagues NEPA Marcellus wells

Stray gas plagues NEPA Marcellus wells

By Laura Legere (Staff Writer)

Published: July 10, 2011

Methane that caused a blast in a Dimock water well, forced a family to evacuate a Terry Twp. home and bubbled up in the Susquehanna River was unsettled from porous rock between the surface and the Marcellus Shale as drillers searched for deep gas.

In high-profile cases affecting 35 drinking-water wells in Bradford and Susquehanna counties, state investigators have linked the stray methane to faulty drilling practices that did not account for the gas-rich and highly fractured shallow geology in Northeast Pennsylvania - a hazard that has made the region one of the most difficult places in the state to drill safely into the Marcellus Shale.

As shale gas drilling has increased in Pennsylvania, so has the prevalence of methane migrating into water supplies as a result of the exploration.

The number of new Marcellus wells nearly doubled between 2009 and 2010, but the rate of methane migration more than quintupled: In 2009, there were 1.26 cases of gas migrating into groundwater for every 1,000 new Marcellus wells drilled, according to the Department of Environmental Protection. Last year, there were more than seven cases for every 1,000 new wells.

Of the 10 confirmed Marcellus Shale stray gas cases since the start of 2008 - each of which may include more than one affected water well or flawed gas well - all of them have been recorded in this corner of the state. Seven of the cases were in Bradford County and one each was in Wyoming, Susquehanna and Lycoming counties.

'Complex system'

Why here?

Geologists suspect that a lack of historical drilling in the region combined with a large amount of methane generated deep underground created a gas-charged environment in shallow sandstone layers.

For more than 100 years in western Pennsylvania, formations similar to those now considered a nuisance to Marcellus Shale drillers in the Northeast were targeted by shallow well drillers hoping to draw out the gas.

"These shallow sands that are giving the drillers fits in Bradford and Susquehanna counties were drilled through and probably drained without it

being a big issue more than a century ago," Penn State University geosciences professor Terry Engelder, Ph.D., said.

The geology in Northeast Pennsylvania is also complicated and, in some rural regions, rarely studied, meaning there were few good historical maps for the drillers' reference, said Fred Baldassare, a former stray gas inspector with DEP who now owns Echelon Applied Geoscience Consulting.

"It's a very complex system with deep-seated fractures and deep-seated thrust faults that come to the surface," he said. "These are pathways that are now being understood by industry that maybe at the beginning of the drilling process here they weren't appreciating."

The shallow methane is not necessarily uniform in the layers above the Marcellus. It is present in "a variety of strata - very shallow all the way down through," said Scott Perry, the director of DEP's Bureau of Oil and Gas Management.

"There's a lot of shallow methane and there's a lot of pathways for it to get into groundwater because of the geology."

Natural gas shales like the Marcellus slowly release gas over hundreds of millions of years, and the drifting methane gradually penetrates the porous rock layers above them, Dr. Engelder said.

The drift of gas upward from shales is well known and occurs in regions like Texas and Arkansas, where shale-gas drilling began years before operators turned to the Marcellus, Dr. Engelder said.

Asked why gas drillers did not anticipate the pockets of shallow gas in Northeast Pennsylvania, he said, "The only explanation of course is that the operator was a little bit careless."

Cement flaws

Natural gas wells are built with a nested series of cemented steel casings that each extend deeper underground to protect groundwater from the gas and fluids in the well. The cement and casing is also supposed to isolate gas and fluids encountered in rock formations on the way down from migrating up the outside of the wellbore.

Problems with the barriers are common.

There have been 47 violations issued on 33 Marcellus wells in the first five months of 2011 for casing and cementing problems, according to DEP records.

In 2010, there were 90 violations issued on 64 faulty wells.

Not all of the cement and casing problems led to gas migrating into groundwater. But in cases where methane migration has been tied to Marcellus Shale drilling, state regulators say the most likely cause is that the high-pressure shallow gas is channeling up small gaps or flaws in the cement.

"Pressure-testing casing is important, but cement and cementing practices are really the key to making sure you've got a properly constructed well," DEP's Scott Perry said.

Earlier this year, updated DEP regulations took effect that require a third string of steel casing, cement with gas-blocking additives in areas with known shallow gas-bearing zones and a longer period to let the cement harden.

'Naturally occurring'

Because methane also reaches aquifers through natural fractures or spreads through the breakdown of organic materials without any man-made interference, gas is present in many water wells before drilling occurs.

The industry has worked to publicize the widespread presence of pre-existing methane in Pennsylvania water wells, but that campaign has sometimes served to create public doubt that drilling is ever responsible for residents' bubbling or flammable water.

When former Gov. Tom Ridge was a guest last month on Comedy Central's "Colbert Report" to advocate for natural-gas drilling on behalf of the Marcellus Shale Coalition, the show played a clip of a Bradford County resident setting fire to her tap water - one of the 17 water supplies the state determined had been impacted by methane seeping from Chesapeake Energy gas wells and for which the company paid a \$900,000 fine.

"It's just naturally occurring," Mr. Ridge said. "It occurs all over the country."

Efforts by the industry to downplay or deny the migration problems often mask the efforts it is making to solve the problems.

Even before the strengthened state rules took effect, some operators were going beyond the requirements to find hazards and prevent problems before gas made its way into water, say scientists working with the industry on the problem.

Several operators began using mud rather than air to drill into the shale, a slower method that creates a cleaner wellbore and allows technicians to study the presence of gas in rock layers encountered on the way down, Mr. Baldassare said.

Operators are also studying the isotopic signatures - chemical fingerprints of the gas - to help determine its provenance. They are reconfiguring their cement mixes with additives like latex to make it more impermeable by gas.

Before they drill, companies are using advanced seismic data to identify problem areas; after they drill, companies are performing tests called bond logs to evaluate the cement seal against both the steel casing and the rock.

"I do get a little disappointed when I hear the standard comment, 'Methane occurs naturally in the groundwater system. End of story.' That doesn't do anything to advance the understanding," Mr. Baldassare said.

"But behind the scenes, I do know operators are doing this and not just a couple," he added. "They really want to understand this and they want to avoid future problems. And I think it's working."

Unsolved problems

Finding the solution for the methane migration problem will not be simple.

A stray gas case in Wyoming County was discovered in late 2010, when DEP tested the headspace above a Washington Twp. water well and found methane at explosive levels.

The department found methane leaking from the space between casing strings in a nearby Chesapeake Energy well then determined an "extremely close" match between the leaking gas and the gas found in the affected water well.

In emails to the department, Chesapeake argued that it had done everything right: It built the well with the extra string of cemented steel casing, ran tests to check the integrity of the cement and found normal bonds and no channeling.

In a statement, Chesapeake said that "repeated joint testing by both Chesapeake and the PADEP found no issue" with the suspected gas well. The company also disputed DEP's isotopic match between the gas in the wells and said "extensive testing - including compositional and isotopic analyses of samples from the water well and from our nearby gas wells - confirm that the source is not methane from any Chesapeake wells."

On May 31, the department wrote to Chesapeake that its investigation "indicates that gas well drilling has impacted" the water supply.

Asked last month if stray gas problems could still be possible given the more robust rules adopted by the state, Mr. Perry said that "investigations are ongoing."

"Obviously, we always need to evaluate whether greater specificity on the rules will ultimately be needed or not," he said.

Dr. Engelder said that as long as the state is finding violations, "you can take the next logical step, which is obviously they haven't solved the problem completely."

"The fact is," he said, "it's in the best interest of any company to make sure this migration is brought to an end."

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Read more: <http://thetimes-tribune.com/news/stray-gas-plagues-nepa-marcellus-wells-1.1173187#ixzz1RiBOh3e7>

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